U.S. Serial No. 09/877,625
Reply to Office Action of: 06/19/03
Family Number: P1999I009-US2

AMENDMENTS TO THE CLAIMS

1. (currently amended) A method to determine the organic acid content of petroleum streams comprising:

(a) irradiating a sample of said petroleum stream with IR radiation;

(b) determining ~~the absorption~~ an IR absorbance spectrum wherein said IR radiation is only in the spectral ranges having wavelengths 1000-1350 cm^{-1}, 1550-2200 cm^{-1}, 2400-2770 cm^{-1}, and 3420-4800 cm^{-1}; and

(c) correlating all of said wavelengths of said ~~absorption~~ IR absorbance spectrum determined in step (b) with the organic acid content of said petroleum stream using linear multivariant regression analysis.

2. (original) The method of claim 1 wherein said organic acid content is in units of ASTM TAN.

3. (currently amended) The method of claim 1 further comprising the step of heating a sample of said petroleum stream having boiling points below 1050°F, at a temperature between 25°C and 125°C during said irradiating step.

4. (original) The method of claim 3 wherein said temperature is between 40°C and 100°C.

5. (original) The method of claim 4 wherein said temperature is between 55°C and 75°C.

6. (currently amended) The method of claim 1 wherein the ~~optical~~ IR absorbance for every spectral frequency is between 0 and 2.0 absorbance units.

7. (currently amended) The method of claim 5 wherein the ~~optical~~ IR absorbance for every spectral frequency is between 0 and 1.75 absorbance units.

8. (currently amended) The method of claim 3 wherein said sample ~~has~~ is a mixture of petroleum streams having a boiling points below 1050°F.

9. (currently amended) The method of claim ~~3~~ 4 wherein said sample is a ~~known~~ mixture of petroleum streams having a boiling points ~~above and~~ below 1050°F.

10. (original) The method of claim 1 wherein said IR radiation is in the spectral ranges 1000 and 4800 cm^{-1}.

11. Please cancel claim 11.

12. (currently amended) The method of claim 1 further comprising the step of orthogonalizing the ~~absorption~~ IR absorbance spectrum so as to eliminate environmental and instrumental contributions.

13. (currently amended) The method of claim 1 further comprising the step of using said ~~orthogonolized spectra~~ IR absorbance spectrum of a set of samples, the calibration samples, which are representative of the variability of petroleum feed and process streams, to develop a prediction regression model having regression factors to predict the TAN of said streams to an predetermined accuracy ~~that renders the invention useful to the application~~.

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14. (currently amended) The method of claim 13 wherein said number of samples is at least 8 times the number of regression factors in the model~~, and more preferably 10 times the number of regression factors~~.

15. (original) The method of claim 13 wherein said samples include both whole crudes and pipestill distillation factions.

16. (currently amended) The method of claim 13 wherein average prediction error for a sample set of whole crude and pipestill and laboratory distillation fractions are less than 0.25 ~~and more preferably less than 0.15 TAN units~~.

17. (original) The method of claim 1 utilizing a sufficient number of calibration samples to achieve a predetermined accuracy.

18. (original) The method of claim 17 wherein said number of calibration samples exceed 100.

19. (original) The method of claim 17 wherein said number of calibration samples exceed 400.

20. (currently amended) A method to optimize blending of two or more petroleum feedstreams <u>including organic acids</u> having different levels of TAN wherein the feedstream blend is processed into process streams comprising:

(a) blending said feedstreams ~~in certain~~ <u>predetermined</u> proportions to form a feedstream blend;

(b) measuring the TAN level of said feedstream blend and/or said processed streams using the method of claim 1;

(c) comparing the TAN level of said feedstream blend and/or process streams to a predetermined TAN level; and

(d) adjusting the proportions of said feedstreams in the blending step so that the TAN level of the feedstream blend and/or process streams is equal to or less than said predetermined level.

21. (currently amended) In a method for determining the TAN value of a crude oil including organic acid, the improvement which comprises determining the TAN level of the crude oil by the method of claim 1.~~, valuing the crude oil according to said TAN level~~.

22. (currently amended) A method to optimize the addition of organic acid neutralizing agents to a petroleum feedstream that is processed into process streams comprising:

(a) determining the ~~optical~~ IR absorbance spectrum of the feedstream and/or processed streams wherein said IR radiation is only in the spectral ranges having wavelengths 1000-1350 cm^{-1}, 1550-2200 cm^{-1}, 2400-2770 cm^{-1}, and 3420-4800 cm^{-1}; and

(b) predicting the organic acid content and/or corrosion of the feedstream and/or processed streams from ~~its~~ all of said wavelengths of said IR spectrum determined in step (a);

(c) adding the neutralizing agent in batch or intermittent or continuously mixed flow;

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(d) measuring the ~~optical~~ IR spectrum of the treated feedstream and/or processed streams;

(e) predicting the remaining acid content and/or the corrosion rate of the treated feedstream and/or processed streams without removing the neutralized products or unreacted neutralizing agent; and

(f) controlling the amount or blend of neutralizing agents, and/or the temperature, pressure, mixing, or flow conditions in the neutralizing process to achieve the target acid level and/or corrosion rate in the treated feedstream and/or processed streams.

23. (new) The method of claim 1 wherein said sample is a mixture of petroleum streams having a boiling point above 1050°F.

24. (new) The method of claim 13 wherein said number of samples is at least 10 times the number of regression factors in the model.

25. (new) The method of claim 13 wherein said average prediction error for a sample set of whole crude and pipestill and laboratory distillation fractions are less than .15 TAN units.